WE-525T Antenna Analyzer Manual and Specification

1.0 Description

This product is designed to speed and ease the testing and tuning of antenna systems. Graphical displays of SWR, Return loss, Distance to Fault and Cable Loss are provided. Impedance parameters are displayed in numerical format and with a smith chart.

Frequency ranges are selected through user defined presets, or optionally can be directly set with centre frequency and span settings.

The velocity factor of the cable can be set through presets for different cable types, or directly entered.

The design is based around stable synthesised signal sources, an SWR bridge, and analog and digital signal processing.

Care was taken in the design to ensure robust mechanical interfaces.

The fine frequency resolution of 100 Hz (10 kHz span) allows analysis of systems with a high Q, e.g. magnetic loop antenna.

Incident and reflected signals are down-converted to a low IF. Phase and amplitude information is extracted from these signals using digital signal processing techniques. From this information, all displayed measurements are derived.

Measurement reference plane is adjustable. This means impedance can be measured at the end of an intermediate coaxial cable directly.

The product may also be used as a fixed level signal source.

The product is factory calibrated with open circuit, short circuit and 50 ohm load terminations. This enables three-term error correction for enhanced accuracy.

These correction coefficients are permanently stored. They are overwritten when the product is re-calibrated.

The product is rechargeable and features auto power down to maximise operational time.

2.0 Specification

Electrical

Adjustable frequency range:

Centre frequency range:	1.5 – 520 MHz
Centre frequency accuracy:	+- 30 PPM @ 25 deg C
Sweep widths:	10kHz to 200 MHz in 1,2,5 sequence and CW
Frequency Presets:	Preset1: User defined Preset2: User defined
Sweep time:	approx. 1.8 second repetitive
Frequency Resolution For SWR /Return Loss Plots:	101 points per sweep
Output level:	- 8 dBm +- 2 dB
Harmonics:	< -25 dBc
Reflection measurement range:	Return Loss: 0 to 45 dB SWR: 99 to 1.0
Measurement resolution:	0.1 dB
Directivity:	> 35 dB (1.5 – 5.0 MHz) > 45 dB (5.0 – 520 MHz) (see Note 1)
Source Match:	> 10 dB
Marker functions:	Normal, Marker to frequency of minimum SWR. Marker to DTF.
Limit lines:	SWR: None,3,2,1.5,1.2 and Adjustable Return Loss: None,-6dB,-10dB,-14dB,-20dB and Adjustable
Complex Measurements:	Z=R+jX, C, L, |Z|, |Γ|, θ, Smith Chart
Measurement range:	
1.5 – 520 MHz:	R<999, |X| < 999, C< 999999pF, L< 999999nH, |Z|<999, |Γ| <1, -180 < θ < 180
Port Extension:	99 metres max.

Distance to Fault:	Five ranges to cover maximum distances 25m to 330m. (RG58 Cable)
Cable Loss:	0 – 20 dB

Note 1: Except >30 dB at 157.05 MHz and 514 MHz

General

System Impedance:	50 ohm
Connector:	N Female
Display:	Graphical 64 x 128 LCD Monochrome backlit
Supply:	Internal 2xAA 1300mAH NiMh
Battery life:	2.0 Hrs continuous operation
Charging:	3 hr fast charge with supplied PSU adapter. Input: 90 – 264V AC Output: 5V, 1A UK: 3 pin, Euro: 2 pin Universal type supplied for North America, Australia, etc
Auto power off:	Switches off 5 minutes after last key press

Mechanical

Size:	155mm x 96 mm x 30mm approx.
Weight:	280g approx.
Case:	Black ABS plastic

Environmental

Operating temperature range:	0 – 50 degrees Celsius

Standards

CE Compliant (EN61010-1, EN61326-1, EN61326-2-1)

3.0 Operation Instructions

Hold down PWR key for about four seconds until unit powers up. Select required measurement from the menu using the up/down keys and the E key.

The product is turned off by momentarily pressing the PWR key.

SWR

Navigate through the required options using arrow and E keys until the required plot of SWR versus frequency is displayed. The first option is to set the frequency range either through user alterable start and stop frequencies in the Preset menu, or through user alterable centre frequency and span frequencies in the adjustable menu. On the graphical plot, use the left/right keys to move the marker left/right. Press the down key to move the marker to the frequency of minimum swr.

Limit lines can be set and Pass/Fail indicated. To do this power off unit. Power on whilst holding down the E key. This brings up the Utilities Menu. Select Set Limit and navigate through to set the desired limit value from the list of preset values, or user define. Then return to the main menu and exit.

Return Loss

Navigate through the required options until the required plot of Return Loss versus frequency is displayed. The first option is to set the frequency range either through user alterable start and stop frequencies in the Preset menu, or through user alterable centre frequency and span frequencies in the adjustable menu. On the graphical plot use the left/right keys to move the marker left/right. Press the down key to move the marker to the frequency of minimum return loss.

Limit lines can be set and Pass/Fail indicated. To do this power off unit. Power on whilst holding down the E key. This brings up the Utilities Menu. Select “Set Limit” and navigate through to set the desired limit value from the list of preset values, or user define. Then return to the main menu and exit.

Distance to Fault

Navigate through the options, first selecting the velocity factor of the cable from a list of presets or custom define.

Select required distance option from the list of presets. The cable length should not exceed the maximum distance specified for each option.

The DTF plot is generated from an Inverse Discrete Fourier Transform of measured complex frequency domain reflection data.

Discontinuities in impedance along the cable length will show as vertical lines of height proportional to the reflection at these discontinuities. The horizontal axis is proportional to distance. The marker shows the actual distance to the discontinuity (or fault).

Please note that a properly working antenna system will show a discontinuity at the end of the cable due to reflections over the majority of the DTF frequency range. Ie an

antenna will be matched to the cable impedance for a small fraction of the total DTF measurement frequency range.

This will allow the length of the feeder cable to be measured, even with the antenna connected.

Cable Loss

Connect feeder cable with the antenna end open circuited. Cable loss is displayed at the marker frequency.

Impedance Measurement Mode

Navigate through the options, first selecting the velocity factor for the interconnecting cable from a list of presets or custom define.

Numerical

Impedance is measured at the marker frequencies set within the frequency span width by using the ← → keys.

If | z|> 999 then the parameters displayed are | Z|> 999 and the magnitude and phase of the reflection coefficient.

Otherwise, the parameters displayed are: Z=R+jX, the value of L or C computed from X, and the magnitude and phase of the reflection coefficient.

The measurement plane can be altered by adjusting parameter D with the ↓ and ↑ keys.

I.e. to measure the impedance at the end of a length of coaxial cable, with the cable open circuited at the end, adjust D until a reflection coefficient phase of 0 degrees is measured, then connect the load to be measured. (E.g. the base of a vertical antenna) D corresponds to the length of the cable (m).

Alternatively, if the cable length is known, enter D directly as the cable length.

Smith Chart

Impedance is measured at the marker frequency set within the frequency span width by using the ← → keys.

Impedance is displayed in the form R + j X

The measurement plane can be altered by adjusting parameter D with the ↓ and ↑ keys.

D corresponds to the length of the cable (m).

Data Averaging

To reduce the effects of noise, data averaging can be employed. To do this, go into the Utilities menu and select Averaging. With this function turned on, the letter A is displayed in the bottom right of the relevant displays.

Averaging in this mode is applied to the marker data for SWR, Return Loss, Cable Loss and Impedance in numerical mode.

Calibration

With nothing connected to the RF port, the displayed Return loss level should typically be < +- 0.25dB. Also the measured reflection coefficient phase should typically be < +-5 degree.

If the displayed parameters are significantly greater than this, then consider re-calibration.

To do this power off the unit. Power on whilst holding down the E key. This brings up the Utilities Menu. Enter the System menu. Enter the PIN. This is the ↑ key, E key and ↑ key again pressed in quick succession. With nothing connected to the RF port, select the Cal Option.

Connect short, open and load standards as directed.

Do not proceed through the calibration utility menu without these terminations, or the existing stored calibration data will be lost**!**

Good quality N short and load terminations are adequate for this. The N socket can simply be left open for the open circuit calibration.

The unit will then return to the Utilities menu. Select Exit to return to normal operation.

Battery Charging

Use supplied 5V 1A regulated adapter only for charging. Momentarily pressing the PWR key during charging will display " Battery Charging" When the battery has finished charging pressing the PWR key will show the usual PWR up display instead.

The unit can not be operated with the charger connected.

Battery life is not guaranteed. If internal batteries need replacing, then replace with 1300mAH NiMh AA. Replacing with higher capacity will cause battery charging to operate incorrectly.

Do not interrupt the charging supply during charging. This may result in overcharging the battery, reducing battery life.

Only charge the battery when the ambient temperature is between 10 and 35 deg C
Do not charge the unit in a confined space or near naked flame.

Reset

Holding down the PWR key and ↓ key together for 3 seconds restores the default settings of the instrument. Calibration data is unaltered.

4.0 Limitations

This product, similar to most products of this type is susceptible to interference from very strong RF signals. If this occurs, then try operating at a different time.

Do not expose the product to water. Light splash resistant.

5.0 Precautions

This product, similar to all products of this type, emits a low power radio frequency signal.

When connected to an antenna, it may cause interference to neighbouring radio communication systems. Connect for only as long as is necessary.

The user is responsible for the consequences of any interference caused.

The antenna port is ESD protected. However, excessive static build up on an antenna may cause damage to the product when connected. As a precaution, discharge antenna before connecting.

6.0 Servicing and Repairs

The product may be returned to Waterbeach Electronics Ltd for servicing and repairs.

7.0 Warranty

The warranty covers defects in material and manufacture under normal use for one year (excludes batteries).

! Avoid touching internal electronic circuitry- Static sensitive!

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